STELLAR POSITIONS AT LWIR WAVELENGTHS

NEW RESULTS USING MSX

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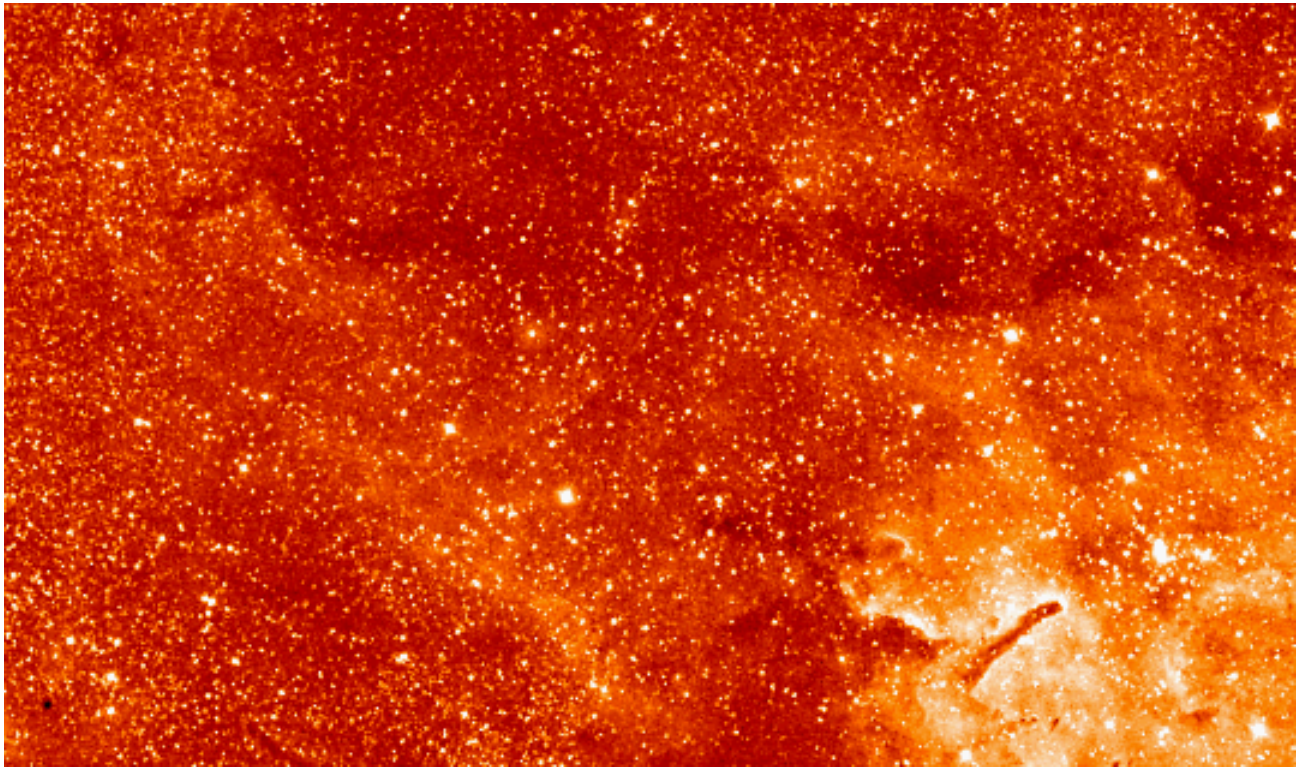
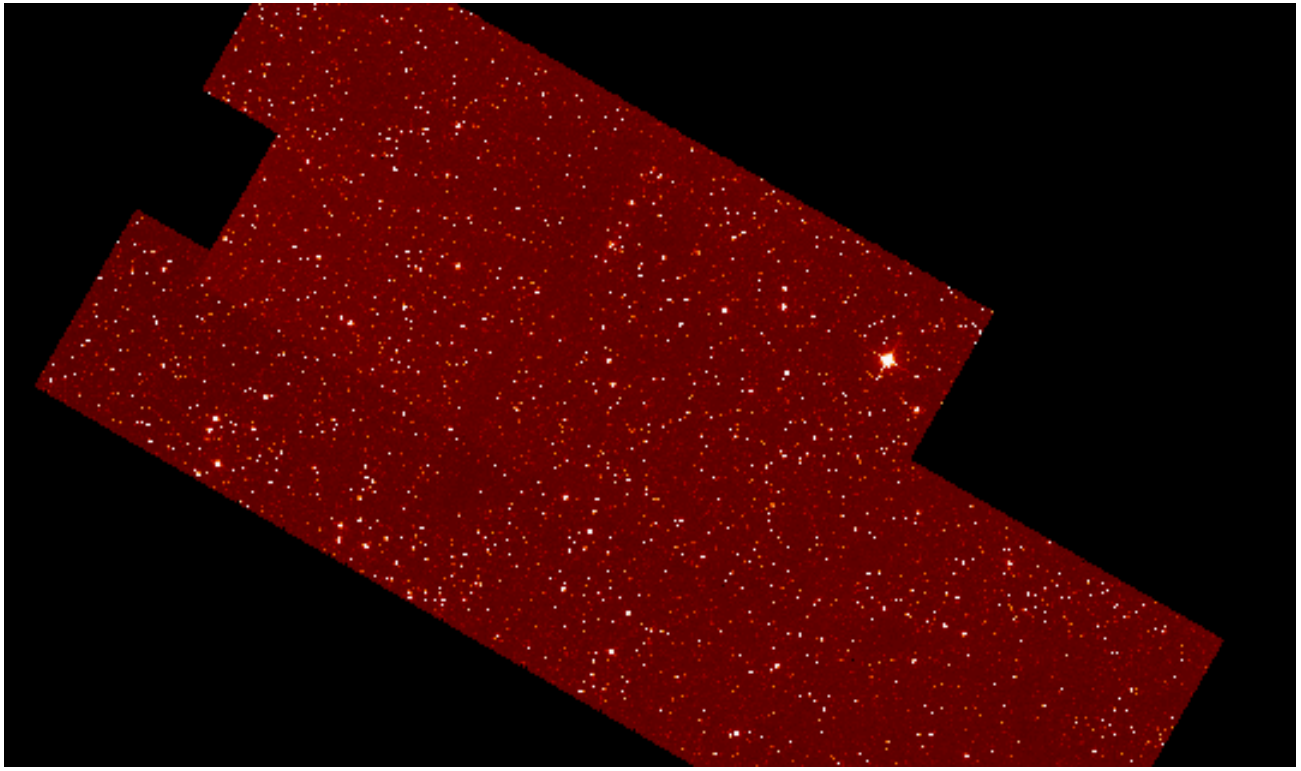
A Comparison of the IR and Visible Sky

- Visible, SWIR and LWIR
- Different components dominate at different wavelengths
  - Visible –stars, emission line nebulae, extincting clouds
  - SWIR – stars, reflection nebulae
  - LWIR – late-type stars, pre- and post-main sequence stars, emission from dust clouds
- Not all IR stars have visible components
- Must avoid confusion introduce by binaries
- Differences are most pronounced near the Galactic plane

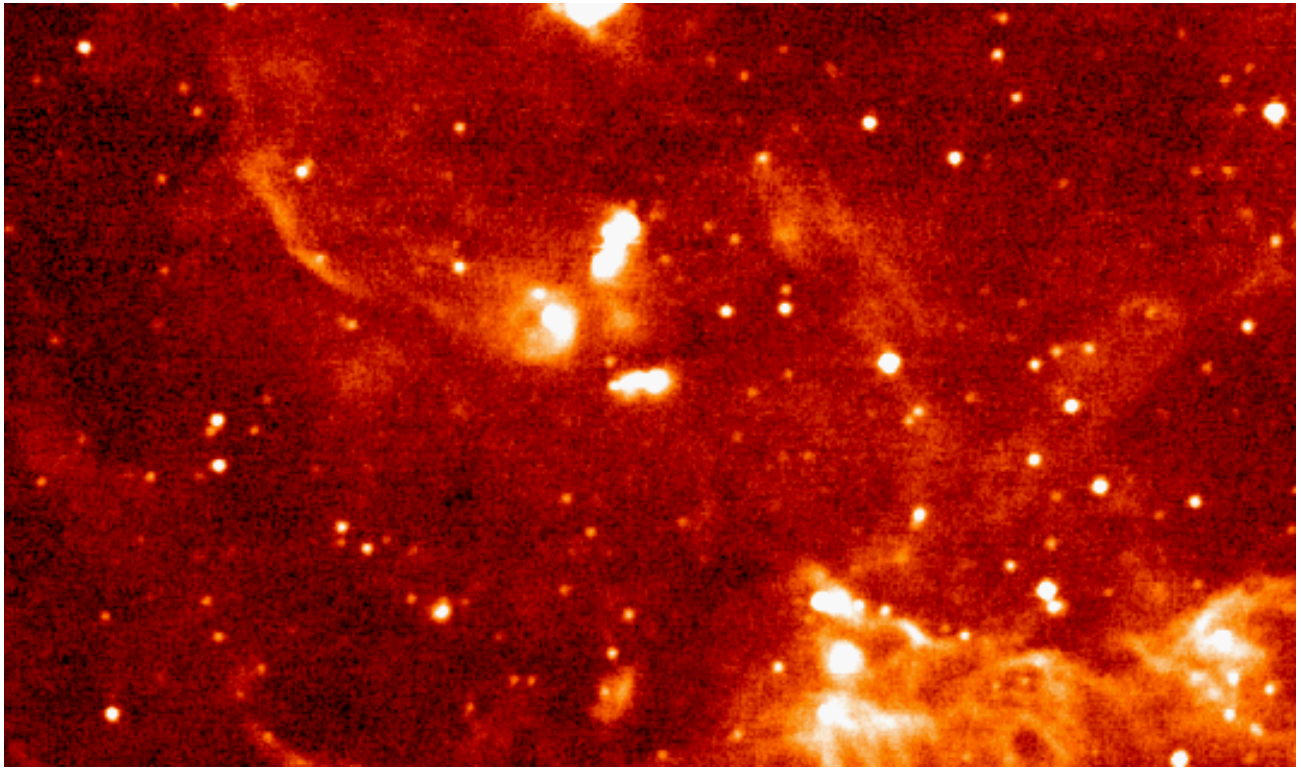
DSS Red Plate, l=60, b=0



2MASS K_s Band, l=60, b=0



MSX Band C, l=60, b=0



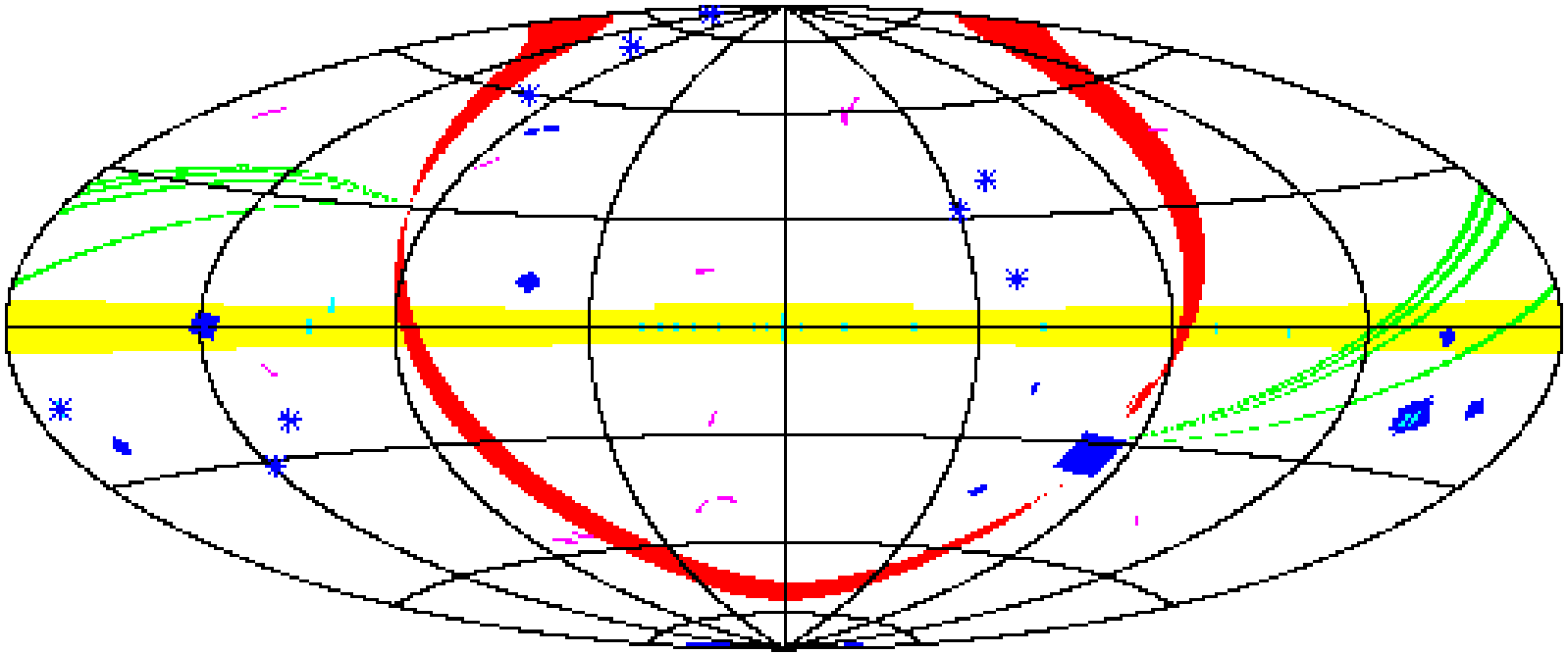
Combined 2MASS-MSX View of the Galactic Center

State of the Art in IR Catalogs

- **SWIR**
  - **2MASS survey: all sky in J, H, K bands**
    - **Astrometric accuracy of 0.2 arcseconds (~1 μradian)**
    - **Supplemented by bright star catalog from CIO, IRAS and MSX**
- **LWIR (and VLWIR)**
  - **Infrared Astronomical Satellite (IRAS), 1983: 96% of sky**
    - **12, 25, 60, and 100 μm**
    - **~250,000 sources**
    - **1σ errors in 12 μm positions**
      - **3” x 16” in PSC; 4” x 27” in FSC**
  - **MSX survey, 1996/7: Galactic Plane, IRAS gaps, selected areas**
    - **8.3, 12.13, 14.65, 21.34 μm bands**
    - **~330,000 sources in Ver 1.2**

MSX IR Survey Coverage Areas

- Yellow = Galactic plane survey
- Red = Areas missed by IRAS
- Green = Zodiacal scans
- Light blue = Galactic deep fields
- Blue = Selected areas Purple = Solar system objects

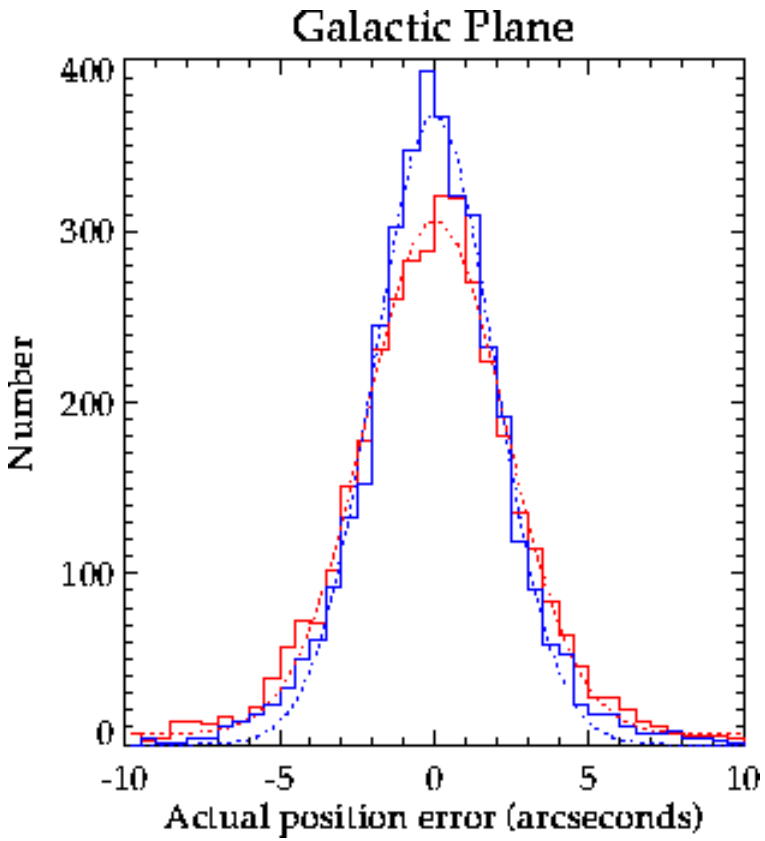


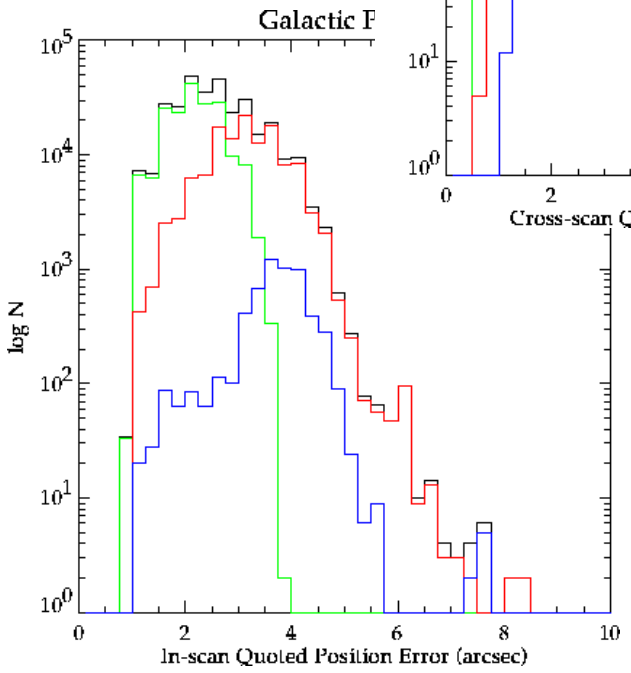
MSX PSC Version 1.2

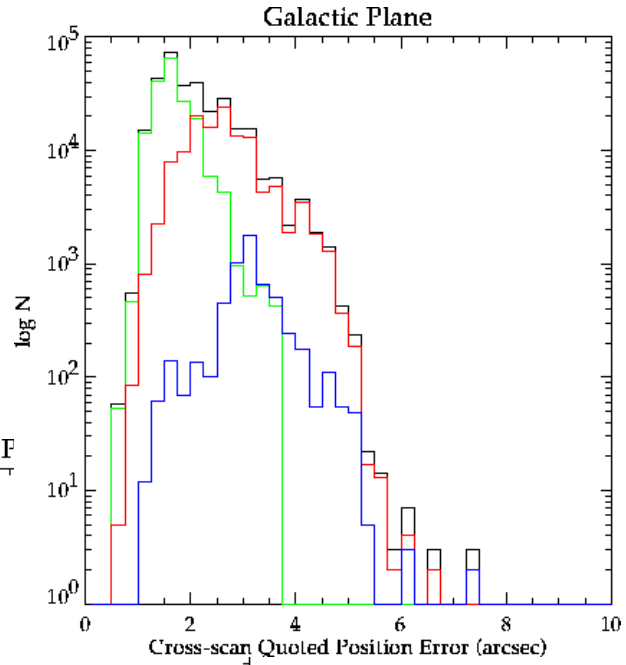
- **Released June 1999**
  - **Details available in Explanatory Guide, Egan et al.**
- **Astrometric accuracy**

	σ_{FIT}	$\langle\sigma_{PSC}\rangle_{Q>2}$	$\langle\sigma_{PSC}\rangle_{Q=4}$	$\langle\sigma_{PSC}\rangle_{Q=3}$	$\langle\sigma_{PSC}\rangle_{Q=2}$
GP-in	**2.26”**	**2.57”**	**2.15”**	**3.12”**	**3.68”**
GP-cross	**1.93”**	**2.06”**	**1.66”**	**2.59”**	**3.12”**
IG-in	**2.13”**	**2.57”**	**2.26”**	**2.83”**	**3.62”**
IG-cross	**1.87”**	**1.79”**	**1.46”**	**2.07”**	**2.73”**

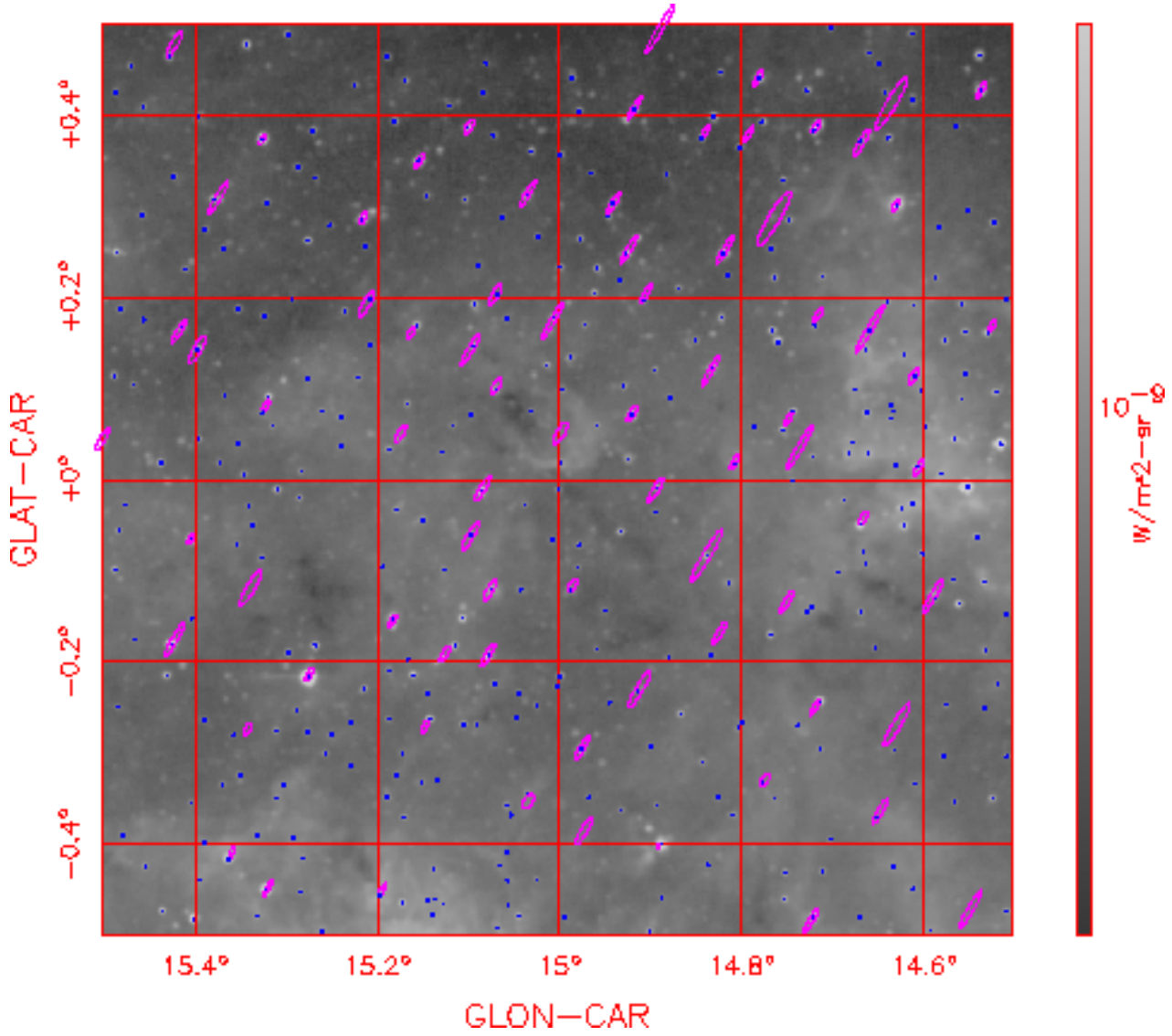
MSX PSC Version 1.2







MSX/IRAS Position and Error Comparison

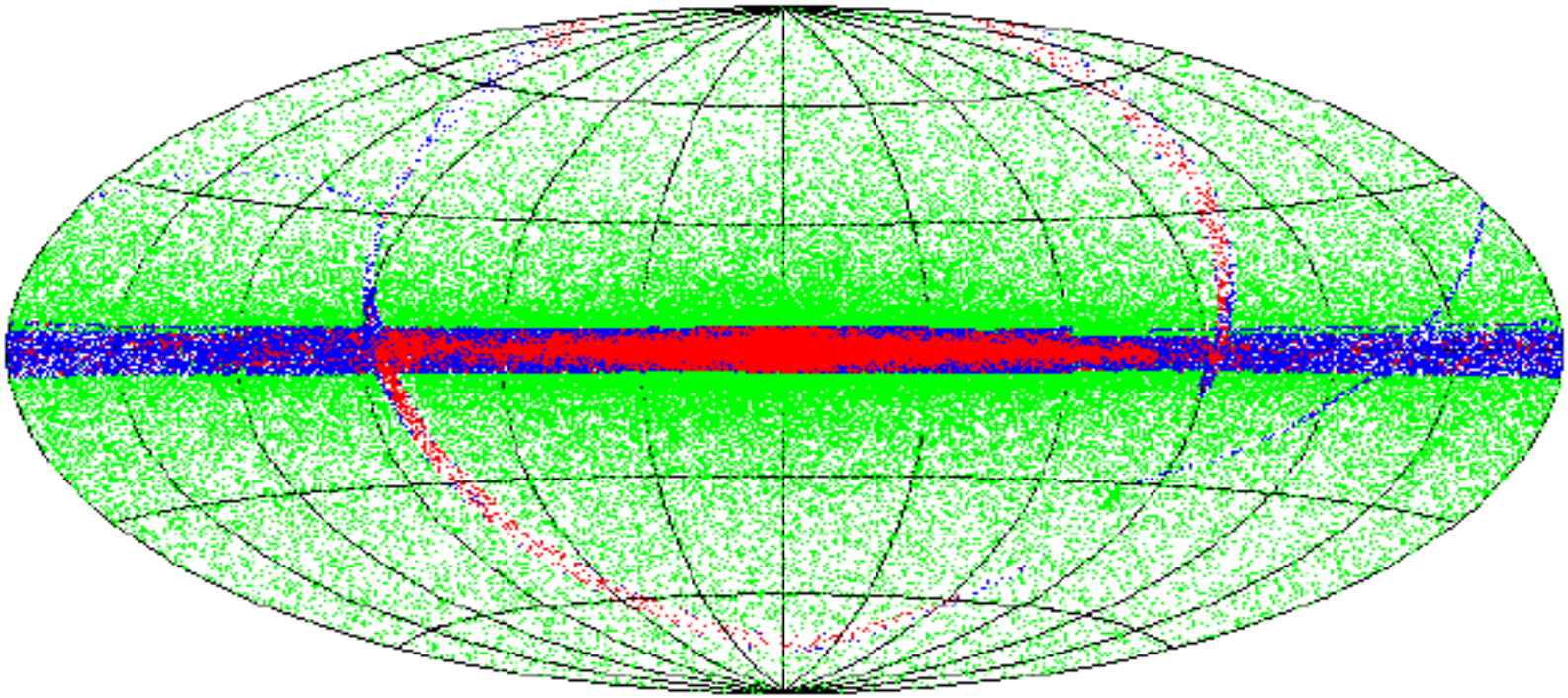


IR Catalogs and DoD Applications

- **Infrared Point Source Sky in LWIR**
  - **LWIR Bright Star Catalog**
    - **IRAS and MSX data**
    - **160,877 stars brighter than 5th mag at 8 μm**
- **LWIR Extended Background (and Point Sources)**
  - **Galactic Plane Survey Image data**
- **Pointing Truth data for IR sensors**
  - **MSX IR Astrometric Catalog**
    - **177,860 stars brighter than 8th mag at 8 μm**
    - **~1 μradian position accuracy**

All Sky LWIR Bright Star Catalog

- **Stars brighter than 5th magnitude (~0.5 Jy) at 8.3 μm**
  - **Based on MSX Ver. 1.2 and IRAS Ver. 2 catalog**
- **Green = IRAS measurements only**
- **Red = MSX measurements only**
- **Blue = MSX and IRAS measurements**



MSX Infrared Astrometric Catalog

- **Version 4.2.1 (Egan and Price 1996 AJ, 112, 2862)**
  - **FK5, PPM, PPMS and ACRS catalogs as base**
  - **Cross referenced with IRAS catalog**
    - **Color criteria to avoid improper matches**
  - **MSX fluxes predicted**
    - **Using Vmag plus IRAS colors where available**
    - **V mag and spectral type otherwise**
  - **Keep astrometric stars brighter than 0.58 Jy (8th mag) at 8.3 μm**
    - **Total of ~177,000 stars**
    - **Approximately four per square degree**

Future Directions

- **Version 2 of MSX Point Source Catalog**
  - **Due mid-2001**
  - **Contains Point Sources from all DCEs**
  - **Improved position errors**
    - **Using new Definitive Attitude Files**
  - **Improved catalog completeness**
    - **At flux levels < 1 Jy**
- **Version 5 of MSX IR Astrometric Catalog**
  - **Tycho 2 Positions**
  - **MSX PSC Version 2 results**